REMARKS/ARGUMENTS

Reconsideration of the application, as herein amended, is respectfully requested.

Status of Claims

Claims 1, 2 and 4-25 are pending in the application, with claims 1 and 23 being the only independent claims. Claim 25 has been added. Support for claim 25 can be found, for example, in Fig. 2 and paragraph [0056] of the published version of the specification.

Overview of the Office Action

Claims 1, 2, 4-12, 15, 19, 20, 23 and 24 stand rejected under 35 U.S.C. §102(a) as anticipated by WO 01/59895 (*Paschotta*).

Claims 13, 14, 16-18, 21 and 22 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Paschotta*.

Summary of Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The specification discloses a laser device for generating laser pulses with an optically pumped semiconductor laser. The laser device includes a semiconductor laser having an active layer; a first pump radiation source which is monolithically integrated into the semiconductor laser; an external resonator; and at least one mode-locker. The active layer is optically pumped by the monolithically integrated first pump radiation source. *See, e.g.*, Fig. 2; and paragraphs

[0055] to [0058] of the published version of the specification (US Patent Application Publication No. 2004/0190567).

Allowability of the Claims

Independent Claim 1

Independent claim 1 recites, *inter alia*, the following:

> "a semiconductor laser having an active layer;
>
> a first pump radiation source which is monolithically integrated into the semiconductor laser;
>
> wherein the active layer is optically pumped by the monolithically integrated first pump radiation source" (emphasis added).

Applicants submit that claim 1 is not anticipated by *Paschotta* because *Paschotta* fails to disclose, either expressly or inherently, each and every element set forth in claim 1. In particular, *Paschotta* fails to disclose or teach the limitation that an active layer is optically pumped by a monolithically integrated first pump radiation source, as is expressly recited in applicants' independent claim 1.

On pages 2 and 3 of the Office Action, the Examiner states that the laser device of *Paschotta* includes:

> "a semiconductor laser having an active layer (*Fig 1: 3 Multi Quantum Well/gain layer*)(*ABSTRACT: Band-gap engineering can be used ... even integrate gain ... within the same wafer*);
>
> a first pump radiation source which is monolithically integrated into the semiconductor laser (*It is inherent and known in the art that semiconductor laser device gain/active/quantum well layer are driven via the electrodes integrate into the semiconductor cause semiconductor to lase*)".

In other words, according to the Examiner's interpretation, the laser device of *Paschotta* has electrodes for the active layer (3), and such electrodes qualify as a monolithically integrated first pump radiation source.

Applicants respectfully disagree.

First of all, *Paschotta* does not disclose or teach that its laser device has electrodes for the active layer (3). On the contrary, *Paschotta* explicitly explains that:

> "The laser uses a semiconductor wafer in which a stack of quantum wells (3) is grown adjacent to a single Bragg-mirror (4) structure. Light from one or more multi-mode light-power diode lasers (7) is focused onto the face (21) of the wafer and pumps the wells by absorption in the barrier regions" (emphasis added) (*see* Abstract of *Paschotta*).

In other words, the active layer (3) of the laser device of *Paschotta* is activated by the light of the external pump radiation source (7), not by a current. As a result, there is no need to use, and neither does *Paschotta* provide, electrodes to inject current into the active layer (3). Contrary to the Examiner's interpretation, therefore, the laser device of *Paschotta* does not have electrodes for the active layer (3) that can qualify as applicants' claimed monolithically integrated first pump radiation source.

Secondly, even if the laser device of *Paschotta* had electrodes, they could not qualify as the claimed first pump radiation source. Such electrodes do not emit radiation when energized; rather, they merely inject current into the active layer (3). It is well-known that in such a setting, the active layer (3) would be electrically pumped by the current[1]. Thus, the active layer (3) in *Paschotta* is not optically pumped by a monolithically integrated first pump radiation source, as is required by applicants' independent claim 1.

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[1] On page 8 of the Office Action, the Examiner refers to Fig. 7 of *Chilla* (US Patent Application Publication No. 2003/0012247), and alleges that *Chilla* discloses a monolithic pump source. Again, applicants respectfully disagree. As is clearly shown in Fig. 7 of *Chilla*, the active layer (16) of *Chilla* is electrically pumped. Like *Paschotta*, therefore, *Chilla* fails to disclose or teach a monolithically integrated radiation pump source such as that recited in applicants' claim 1.

Accordingly, *Paschotta* fails to teach or disclose the limitation that an active layer is optically pumped by a monolithically integrated first pump radiation source, as is expressly recited in claim 1.

In view of these differences, withdrawal of the rejection under 35 U.S.C. §102(a) of claim 1 is respectfully requested.

Moreover, in view of the above-discussed fundamental differences between claim 1 and the prior art of record, claim 1 is clearly patentable under 35 U.S.C. 103(a) as well.

Dependent Claims 2, 4-22 and 25

Each of claims 2, 4-22 and 25 depends, directly or indirectly, from independent claim 1, and as such benefits from its allowability.

In addition, these claims include additional limitations which serve to still further distinguish the claimed invention over the prior art of record.

In particular, as discussed above, *Paschotta* fails to teach or disclose a monolithically integrated first pump radiation source. It logically follows that *Paschotta* also fails to teach or disclose a monolithically integrated first pump radiation source which is "arranged laterally adjacent to the active layer," as recited in newly-presented claim 25.

Independent Claim 23 and Dependent Claim 24

Independent claim 23 recites, *inter alia*, "said phase compensation element compensating for group velocity dispersion." Thus, claim 23 does not merely recite a phase compensation element; rather, it recites a phase compensation element that compensates for group velocity dispersion.

As explained in the instant specification, the expression "group velocity" refers to the speed at which the centroid of a wave packet moves in a medium. The dependence of the group velocity on frequency is referred to as the group velocity dispersion. *See* paragraph [0066] of the published version of the specification.

As a consequence of the group velocity dispersion -- i.e. the dependence of the group velocity on frequency -- different spectral components will have different propagation times in the resonator. To compensate for this effect, the present invention utilizes a phase compensation element that has different propagation times for different spectral components/wavelengths. In this way, the pulse widths are reduced and sub-picosecond pulses and femtosecond pulses can be generated. *See* paragraph [0030] of the published version of the specification. The different propagation times for different spectral components/wavelengths result from the refractive index dependence on frequency, e.g., in a prism system or a grating. To compensate for this refractive index dependence on frequency, the optical paths for different spectral components/wavelengths are adjusted so as to be different in the phase compensation element.

Claim 23 is not anticipated by *Paschotta* because *Paschotta* fails to disclose, either expressly or inherently, each and every element set forth in claim 23. In particular, *Paschotta* fails to teach or disclose a phase compensation element which compensates for group velocity dispersion, as applicants recite in independent claim 23.

On page 5 of the Office Action, the Examiner refers to the Abstract and to page 11, lines 15-22 of *Paschotta*, in support of his allegation that *Paschotta* discloses a "phase compensation saturable absorber mirror SESAM 5 and/or Bragg reflector compensating for velocity dispersion" (emphasis added).

Applicants disagree.

It is first noted that the above underlined words are neither present in nor are they supported by the cited portions of *Paschotta*. Rather, these underlined words appear only in the Examiner's remarks. And the Examiner fails to explain or provide any justification for his allegation that each of the saturable absorber mirror (5) and the Bragg reflector of *Paschotta* qualifies as a phase compensation element compensating for group velocity dispersion.

As explained in applicants' immediately preceding response, on page 3, lines 10-20 *Paschotta* teaches the advantages of passive mode-locking in comparison to active mode-locking and teaches that passive mode-locking can be achieved by a saturable absorber mechanism. *Paschotta* thereafter teaches the use of a semiconductor saturable absorber mirror (5) for passive mode-locking (*see, e.g.*, Abstract; and page 5, lines 10-25 of *Paschotta*). Thus, *Paschotta* explicitly teaches the use of the saturable absorber mirror (5) for mode-locking purposes (i.e., to shape and stabilize ultra short pulses). *Paschotta* wholly fails to teach or disclose or suggest the use of the saturable absorber mirror (5) to compensate for group velocity dispersion.

Moreover, the saturable absorber mirror (5) of *Paschotta* is not suitable for compensating group velocity dispersion because it does not have different propagation times for different spectral components. The intensity-dependent absorption characteristics of the saturable absorber mirror (5) of *Paschotta* simply do not, and cannot, have the effect of phase compensation for compensating the group velocity dispersion which is required by applicants' phase compensation element in independent claim 23.

In sharp contrast, claim 23 of the present application expressly recites a "phase compensation element compensating for group velocity dispersion".

In view of these differences, applicants submit that claim 23, and claim 24 which depends from claim 23, are neither anticipated nor rendered obvious by *Paschotta* or by any of the other art of record in this case.

Conclusion

Based on the foregoing, applicants respectfully submit that the present application is now in full and proper condition for allowance. Prompt and favorable action to this effect, and early passage of this application to issue, are once more solicited.

Should the Examiner have any comments, questions, suggestions or objections, he is respectfully requested to telephone the undersigned in order to facilitate an early resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any such fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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